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ABSTRACT

The United States Training and Employment Service General Aptitude Test Battery (GATB), first published in 1947, has been included in a continuing program of research to validate the tests against success in many different occupations. The GATB consists of 12 tests which measure nine aptitudes: General Learning Ability; Verbal Aptitude; Numerical Aptitude; Spatial Aptitude; Form Perception; Clerical Perception; Motor Coordination; Finger Dexterity; and Manual Dexterity. The aptitude scores are standard scores with 100 as the average for the general working population, and a standard deviation of 20. Occupational norms are established in terms of minimum qualifying scores for each of the significant aptitude measures which, when combined, predict job performance. Cutting scores are set only for those aptitudes which aid in predicting the performance of the job duties of the experimental sample. The GATB norms described are appropriate only for jobs with content similar to that shown in the job description presented in this report. A description of the validation sample is also included. (AG)

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FINAL REPORT

TECHNICAL REPORT

ON

STANDARDIZATION OF THE GENERAL APTITUDE TEST BATTERY

FOR

GROCERY CHECKER (ret. tr. 299.468

S-145

(Supersedes B-187)

U. S. Employment Service in
Cooperation with
California State Employment Service

U. S. DEPARTMENT OF LABOR

Washington , D. C.
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STANDARDIZATION OF THE GENERAL APTITUDE TEST BATTERY
FOR
GROCERY CHECKER 299.468

S-145

Summary

The General Aptitude Test Battery, B-1002A, was administered to two samples of Grocery Checkers 299.468. The table below shows for each sample, the year in which data collection was completed, the number included in the final sample and the type of criterion used for validation purposes.

Sample		N	Criterion
I (Safeway Stores)	1958	145	Number of items correctly checked in one-hour-work-sample.
II (Orange Coast College)	1958	92	Instructors ratings.

Data for the two samples were analyzed separately and in combination. On the basis of the statistical and qualitative analysis of the data, Aptitudes G-Intelligence, N-Numerical Aptitude, and Q-Clerical Perception were selected for inclusion in the test norms.

GATB Norms for Grocery Checker 299.468 - S-145

Table I shows, for B-1001 and B-1002, the minimum acceptable score for each aptitude included in the test norms for Grocery Checker 299.468.

TABLE I

Minimum Acceptable Scores on B-1001 and B-1002 for S-145

B-1001			B-1002		
Aptitude	Tests	Minimum Acceptable Aptitude Score	Aptitude	Tests	Minimum Acceptable Aptitude Score
G	CB-1-H CB-1-I CB-1-J	105	G	Part 3 Part 4 Part 6	100
N	CB-1-D CB-1-I	100	N	Part 2 Part 6	95
Q	CB-1-B	100	Q	Part 1	100

Effectiveness of Norms

The data in Table V-C indicate that 40 of the 64 poor workers, or 62 percent of them, did not achieve the minimum scores established as cutting scores on the recommended test norms. This shows that 62 percent of the poor workers would not have been hired if the recommended test norms had been used in the selection process. Moreover, 130 of the 154 workers who made qualifying test scores, or 84 percent, were good workers.

TECHNICAL REPORT

I. Problem

This study was conducted to determine the best combination of aptitudes and minimum scores to be used as norms on the General Aptitude Test Battery for the occupation of Grocery Checker 299.468 .

II. Samples

This study is based on two samples of Grocery Checkers 1-03.05 at Orange Coast College, Costa Mesa, California and Safeway Stores, Incorporated, San Francisco, California. The test norms were developed on the basis of the results of both samples.

Sample I - Safeway Stores

The GATB, B-1002A, was administered during the period August 12, 1957 to March 31, 1958 to a sample of 245 Food Clerk trainees (D.O.T. Grocery Checker 299.468) in 23 groups of five-day classes at the Safeway Stores, Incorporated, Training Center, Oakland, California. The weeks during this period which were shortened to 4 days by a holiday, or those in which the class consisted of less than 4 trainees were omitted. Of the number tested, 87 had previous experience, mostly with other markets, and were different as to duration, kind, and recency of experience. Although practical considerations necessitated testing all members of the class, it became evident that those with experience tended to achieve higher scores in the final test of checking ability which was the criterion of job performance. Therefore, the 87 individuals who indicated previous experience were eliminated from the final sample. In addition, four individuals resigned before completing training, three did not take the final checking test, and one had a language difficulty. Five individuals were eliminated from the final sample because it was decided that the GATB scores were not true measures of their ability for the following reasons: two were too nervous; one did the practice exercise incorrectly but it was not caught during the practice period, and it was evident that two were not trying. Thus, the final sample consisted of 145 trainees (30 women and 115 men).

The Training Center at Oakland serves the Safeway Bay Zone which includes the San Francisco Bay Area and the central and northern coast counties. The Zone offices in San Francisco control most of the stores' activities. Operations in all stores are uniform, with standard checkstands designed for the company. Greatest distinction between the 140 stores in the Zone is the number of checkstands. A 4-checkstand store is classed as "small," 6 to 12-checkstand stores are "large." Total number employed in the Zone is 1,098, of which 426 are women. Meat departments are separate and are not included in this study.

The company maintains recruitment centers in San Francisco and Oakland where applicants are interviewed during specified days and hours. In the outlying stores the store manager hires for the store. In certain areas there is a 90-day probationary period, in others there is none, depending

on the local union contract. In the latter areas termination of employment is possible only on verifiable evidence of inadequacy. Termination of employment in all cases is the responsibility of the store manager.

The main source of applicants has been drop-ins. Local U. S. E. S. offices furnish most of the rest, with newspaper spreads being used occasionally, and classified ads rarely. Workers are selected on the basis of written applications and a personal interview, covering personality, background, and work experience. Great stress is laid on "stability" of work experience and home background, also on a liking for people. Preferred age range is 20-36, and those older than 29 usually must have had experience. Those over 36 without experience are few, and are usually women. Graduation from high school is required now, although this was not formerly the rule, and occasionally store managers do hire an exception. There are ten trainees with less than a high school education in the experimental sample. Men with some college training are encouraged by mention of possible advancement to management jobs. (The term "college" does not necessarily apply only to academic or scientific degree-conferring colleges and universities but also to the State Junior Colleges offering courses in popular subjects such as merchandising, trade schooling, and the arts).

Men and women must be able to pass a general physical examination, must have no impairment of legs, arms, back, or heart, and must have the stamina to be on their feet for 8 hours daily. Men, in addition, must be able to lift 75 pounds. Vision must be good or correctable. If it seems indicated during the employment interview, a visual test is given at the Training Center by means of apparatus similar to the Bausch and Lomb Orthorater.

Two simple arithmetic tests (originated at Safeway Stores, Incorporated) are administered during the interview. One test consists of problems of adding on paper two 3 digit numbers and recording the sum. The other tests consist of problems of mentally dividing 2 or 3-digit numbers and recording the answers. The tests are two minutes and three minutes long, scores are in terms of excellent, good, fair, and poor. However, there is no point at which an applicant would be rejected because of his scores. Acceptance or rejection is influenced by several factors of which the current need and local labor market are the most important. For example, if a new store is to be opened and there are few applicants available, workers will be hired who do not meet the desired standards.

The Training Center was set up because on-the-job training in checkstand operation proved unsatisfactory. The operation was too complex to be learned without intensive formal training. The Training Center, in operation for 8 years, has proved a success.

The preliminary formal training period is 5 days, and covers checkstand tasks only except for two films on produce. Other tasks are learned in the store. There is no way to estimate store training time because training is influenced by the needs of the store, the work schedule, and the manager's judgment.

Table II shows the means, standard deviations, ranges and Pearson product-moment correlations with the criterion for each sample.

TABLE II

Number of Workers in Sample (N), Means (M), Standard Deviations (σ), Ranges, and Pearson Product-Moment Correlations with the Criterion (r) for Age and Education

Grocery Checker 299.468

	N	M	σ	Range	r
Age (years)					
Safeway Stores	145	24.9	5.5	18-41	-.144
Orange Coast College	92	32.9	8.1	17-55	.020#
Combined	237	28.0	2.4	17-55	.---
Education (years)					
Safeway Stores	145	12.6	1.4	8-17	.118
Orange Coast College	92	11.0	1.6	5-14	.037#
Combined	237	12.0	1.7	5-17	---

Corrected for broad categories

There are no significant correlations between age or education and the criterion for either of the two samples. The data in Table II indicate that the samples are suitable for test development purposes with respect to age and education.

III. Job Description

Job Title: Grocery Checker 299.468

Job Summary: Itemizes and totals cost of customer's purchases of groceries, meat, and produce on a cash register in a self-service supermarket. Receives payment from customer and makes change. Bags articles, prepares stock and produce for sale, and restocks shelves and display cases.

Work Performed: Checks purchases: Lifts articles from customer's cart to checkstand with left hand, rapidly calling out price marked or, for unmarked items, from memory, and enters amount in cash register with right hand, using touch system. Verifies prices of unmarked items when necessary by finding price of item in price-book above cash register. Weighs produce on scales, flipping control wheel to position appropriate part of dial and reads indicated price. Mentally computes price of a quantity other than that advertised, for multiple-price items. Reads amount of tax for sales-taxable items from tax table, enters amount in register, and presses total key.

Receives payment, rakes change, and bags articles. Tears appropriate number of trading stamps from supply on tray of register and hands them to customer. Fills out overring-and-refund form if necessary. Cleans checkstand and adjacent floor area and stocks stand with cigarettes and candy.

Restocks shelves and display cases: Observes stock on shelves and notes stock needed and quantity on appropriate form. Lifts cases from storage area to hand-truck, wheels hand-truck to marking desk, and stamps price on each article in case with proper marker, consulting price-book for correct amount. Pushes hand-truck to shelves or display cases and arranges articles in appropriate section and, for dated stock such as dairy products, according to date or code impressed on containers. Gives stock forms to supervisor for stock-control. Sweeps floors, dusts or washes shelves and display cases, and periodically mops and waxes floors and checkstand counters. When working as produce man, washes and trims vegetables, culls and rearranges produce in display cases.

IV. Experimental Battery

All the tests of the GATB, B-1002A, were administered to each sample.

V. Criterion

Sample I (Safeway Store)
The criterion used for this study consisted of the number of items correctly checked, obtained from one-hour test of checkstand efficiency given on the last afternoon of the training course.

The test, as adapted for the sample, is one hour of checking-out baskets of items representing all the operations learned during the week, including weighing, multiple-priced items, unmarked items, and produce. One basket of 15 items is at each of the nine checkstands. Contents are slightly different in each basket, but the same items over-all are used for each class. A trainee checks out the basket at any one stand, then moves to the next stand vacant, until he has checked out the basket at each of the nine stands. This is repeated until time is called. There is little if any difference in difficulty between the items at one checkstand and another. There is a correct master tape for each register, with which trainees' tapes are compared for errors. Scores for the number correctly checked in one hour are thus derived.

The number of items correctly checked, was selected as the criterion for this study after exploring several other methods of obtaining a measure of work performance. This criterion was selected for the following reasons: this criterion included some influence of accuracy, reduced the scores of the extremely inaccurate, but did not detract from the importance of speed; (2) the Termination Records data were incomplete and were considered as not dependable by the Safeway Stores Personnel Office; (3) the distribution of scores for the number of errors made in checking items in the work-sample appeared to be too restricted to reveal significant relationships with the aptitude scores; (4) the negative correlation between the number of errors and the total number of items checked in the worksample (-.283) indicated that individuals in the sample should be penalized for errors.

In deciding on the criterion, inclusion of accuracy was thought to be essential by company representatives, store managers, and the trainer. However, extended investigation showed no basis for determining the weight which should be given to accuracy. In actuality, Food Clerks' efficiency at the checkstand is judged entirely by speed. There is no check on errors in day-to-day store operations. The Food Clerks are not accountable for cash. In the training class accuracy was stressed in terms of dollar-cost of errors, but only as a training measure.

The criterion scores (number of items correctly checked) approximate a normal distribution. There are 68 above and 77 below the mean. Error scores are not normally distributed. Sixty-two scores fall above the mean and 82 below. The zero limit causes the distribution to be skewed toward the lower end.

The following table gives the means (M), standard deviations (σ), and ranges for total number of items checked and for errors.

TABLE III

	M	σ	Range
Total Checked	304.1	83.9	105 - 579
Errors	16.6	8.9	0 - 56

Sample II (Orange Coast College)
The criterion for this study consisted of instructors' ratings expressed in three broad categories as follows: "Above Average," "Average," and "Below Average." The two instructors placed 3 x 5 cards containing the names of the students in their classes in one of the three categories. The distribution of ratings in the three broad categories and the quantitative values corresponding to the broad categories computed for use in the statistical analysis are shown below.

Criterion Group	N	Quantitative Value
Above Average	26	62
Average	38	50
Below Average	28	39

The instructors had made broad category ratings expressed in five broad categories prior to making the ratings in three broad categories. Each student was rated on both classroom and laboratory work. The instructor

placed an "X" in the box selected to indicate the student as "Outstanding," "Superior," "Average," "Below Average" or "Classed Among the Poorest Students." The rater was directed to keep in mind the status of the student in comparison to students in general in this course. The distribution of ratings in the five broad categories and the quantitative values corresponding to the broad categories computed for use in the statistical analysis are shown below.

Criterion Group	N	Quantitative Value
Outstanding	6	69
Superior	29	58
Average	42	47
Below Average	11	37
Classed Among the Poorest Students	4	29

The coefficient of reliability, corrected for both variables expressed in broad categories was .874, indicating a high significant relationship.

The broad category ratings expressed in three broad categories were chosen as the criterion to be used for this study because this criterion placed approximately 30 percent of the students in the low criterion group whereas, the ratings expressed in five broad categories did not have a division point between the high and low groups.

Final course grades were obtained but they also did not have a division point between the high and low groups because over 90 percent of the students received a final course grade of "A" or "B".

VI. Statistical and Qualitative Analyses

The data for the two samples were analyzed separately and in combination on the basis of both statistical and qualitative considerations. Means, standard deviations, and correlations with the criterion were calculated for the aptitude scores for each sample separately. Means and standard deviations of the aptitude scores were also calculated for the Combined Sample.

A. Statistical Analysis:

Table IV-A shows the means and standard deviations for the aptitudes of the GATB for each sample separately and for the combined sample. The means and standard deviations are comparable to general working population norms with a mean of 100 and a standard deviation of 20 for each aptitude.

Table IV-B shows the correlations between the criterion and the aptitudes of the GATB for each sample.

TABLE IV-A

Means (M) and Standard Deviations (σ) for the Aptitudes of the GATB for Each Sample Separately and for the Combined Sample

Grocery Checker 299.468

Aptitudes	Safeway Stores (N = 145)		Orange Coast College (N = 92)		Combined (N = 237)	
	M	σ	M	σ	M	σ
G-Intelligence	113.3	12.7	105.3	14.9	110.2#	14.2
V-Verbal Aptitude	109.6	15.5	105.5	16.7	108.0	16.1
N-Numerical Aptitude	111.1	11.6	104.5	14.3	108.5	13.1
S-Spatial Aptitude	112.3	18.7	103.5	17.9	108.9	18.9
P-Form Perception	112.9	13.4	107.5	16.9	110.8#	15.1
Q-Clerical Perception	114.9	14.2	107.8	16.1	112.1#	15.4
K-Motor Coordination	109.3	14.9	111.7	14.9	110.2#	14.9
F-Finger Dexterity	102.9	18.1	105.9	17.2	104.1	17.8
M-Manual Dexterity	109.8	16.6	104.8	16.9	107.9	16.9

Highest Mean Scores

TABLE IV-B

Pearson Product-Moment Correlations (Corrected for Broad Categories) with the Criterion for the Aptitudes of the GATB for Sample II and Pearson Product-Moment Correlations with the Criterion for the Aptitudes of the GATB for Sample I

Grocery Checker 299.468

Aptitudes	Safeway Stores (N = 145)	Orange Coast College (N = 92)
G-Intelligence	.329**	.303**
V-Verbal Aptitude	.173	.144
N-Numerical Aptitude	.455**	.436**
S-Spatial Aptitude	.142	.145
P-Form Perception	.262**	.246*
Q-Clerical Perception	.263**	.361**
K-Motor Coordination	.018	.338**
F-Finger Dexterity	.177	.262*
M-Manual Dexterity	.077	.315**

* Significant at the .05 level
** Significant at the .01 level

B. Qualitative Analysis:

The statistical results were interpreted in the light of the job analysis data. The job analysis indicated that the following aptitudes measured by the GATB appear to be important for this occupation.

Intelligence (G) - required to learn rapidly the many details of checkstand operation, to learn daily price changes, and to carry out proper checking sequence while responding pleasantly to customer's conversation.

Numerical Aptitude (N) - required to weigh produce; to compute cost from cost bar; and to compute unit cost mentally when price posted is for two or more items and customer selects less than total number posted.

Clerical Perception (Q) - required to accurately read items and prices from typed pages of price-book and tiny figures on printed tax table; to read quickly and accurately figures 3/8 inches in height or smaller on scale's dial; and to select quickly the proper dial, all at a distance up to three feet.

Manual Dexterity (M) - required in the manual operation of cash register and in the lifting, turning, and packing of merchandise.

C. Selection of Test Norms:

Based on the quantitative and qualitative evidence cited above, Aptitudes G, N, P, Q, K, and M warranted further consideration for inclusion in the test norms. The evidence for each of these aptitudes is indicated below.

Aptitude	Relatively High Mean	Significant Correlation with Criterion	Importance Indicated by Qualitative Analysis
G	X	///	X
N		///	X
P	X	///	
Q	X	///	X
K	X	//	
M		/	X

/// Significant correlations with the criterion for both Sample I and Sample II

/ Significant correlations with the criterion for Sample II

Although Aptitude F showed significant correlations with the criterion for Sample II (Orange Coast College), it was not considered further for inclusion in the norms because there was no other qualitative or quantitative evidence of significance.

Various combinations of Aptitudes G, N, P, Q, K, and M with appropriate cutting scores were selected as trial norms. The B-1002 norms which showed the best selective efficiency for the Safeway Stores sample consisted of G-100, N-95, and Q-100. These norms also have good selective efficiency for the Orange Coast College sample.

In test development studies an attempt is made to develop a set of norms such that the cutting score for each aptitude included in the norms will be set at a five-point score level close to one standard deviation below the aptitude mean of the experimental sample. Adjustments of cutting scores from one standard deviation below the mean are made to effect better selective efficiency of the norms. In this study the aptitude cutting scores are each within 5 points of one standard deviation below the aptitude mean of the combined sample.

VII. Concurrent Validity of Norms

In order to compute the tetrachoric correlation coefficients between the norms and the criteria and apply the Chi Square test, the criteria for the two samples were dichotomized. For Sample I the criterion was dichotomized with an Items Correctly Checked Score of 150 as the critical score. Those workers with a score of 150 were placed in the high criterion group; all others were placed in the low criterion group. For Sample II the criterion was dichotomized so that those students rated as "Above Average and "Average" were placed in the higheriterion group; all others were placed in the low group.

Tables V-A and V-B show the relationship between test norms consisting of G-100, N-95, and Q-100, and the dichotomized criteria for Sample I and Sample II, respectively. Table V-C which is a composite of Tables V-A and V-B, shows the selective efficiency of the norms for the Combined Sample.

TABLE V-A

Relationship between Test Norms Consisting of Aptitudes G, N, and Q with Critical Scores of 100, 95, and 100, Respectively, and the Criterion for Sample I (Safeway Stores)

Grocery Checker 299.468
N = 145

	Non-Qualifying Test Scores	Qualifying Test Scores	Total
Good Workers	15	94	109
Poor Workers	20	16	36
Total	35	110	145

$r_{tet} = .68$ $\quad X^2 = 23.582$

$\sigma_{r_{tet}} = .16$ $\quad P/2 < .0005$

The data in the above table indicate a significant relationship between the test norms and the criterion for Sample I.

TABLE V-B

Relationship between Test Norms Consisting of Aptitudes G, N, and Q with Critical Scores of 100, 95, and 100, Respectively, and the Criterion for Sample II (Orange Coast College)

Grocery Checker 299.468
N = 92

	Non-Qualifying Test Scores	Qualifying Test Scores	Total
Good Workers	28	36	64
Poor Workers	20	8	28
Total	48	44	92

$r_{tet} = .43$ $\quad X^2 = 4.922$

$\sigma_{r_{tet}} = .17$ $\quad P/2 < .025$

The data above yield a tetrachoric correlation coefficient of .43 with a standard error of .17 and a Chi Square value of 4.922 which corresponds to a P/2 value of less than .025. This shows that the norms are significantly related to the criterion for the Orange Coast College sample. The fact that the norms fail 52 percent of the Orange Coast College sample is only a minor consideration in this instance because heaviest weight was given to the Safeway Stores sample in evaluating the selective efficiency of various sets of test norms. Consideration was given to the facts that the Orange Coast College sample was composed of students who were not actually employed as Grocery Checkers and that follow-up on some of the students showed that only a small percentage of those followed-up subsequently became Grocery Checkers. Therefore, the establishment of norms which are failed by a relatively high proportion of the Orange Coast College sample and about the usual proportion of the Safeway Stores sample appears to be justified.

TABLE V-C

Relationship between Test Norms Consisting of Aptitudes G, N, and Q with Critical Scores of 100, 95, and 100, Respectively, and the Criterion for the Combined Sample

Grocery Checker 299.468
N = 237

	Non-Qualifying Test Scores	Qualifying Test Scores	Total
Good Workers	43	130	173
Poor Workers	40	24	64
Total	83	154	237

$r_{tet} = .57$ $\quad X^2 = 27.462$

$\sigma_{r_{tet}}$ $\quad P/2 < .0005$

The data in the above table indicate a significant relationship between the test norms and the criterion for the Combined Sample.

VIII. Conclusions

On the basis of mean scores, correlations with the criterion, job analysis data, and their combined selective efficiency, Aptitudes G, N, and Q with minimum scores of 100, 95, and 100, respectively, are recommended as B-1002 norms for the occupation of Grocery Checker 299.468. The equivalent B-1001 norms consist of G-105, N-100, and Q-100.

The results of the California studies were compared with the following available studies on the occupation of Grocery Checker 1-03.05:

Sample	Company	Location
42 employed workers (B-187 sample)	A & P Food Stores	Detroit, Michigan
47 employed workers	Wrigley's Stores, Inc.	Detroit, Michigan
37 employed workers	Five different companies	Omaha, Norfolk, Nebraska City and Lincoln, Nebraska
52 employed workers	Giant Supermarkets	Washington, D. C.
36 employed workers	National Tea Company	Chicago, Illinois

Since we regard the Safeway Stores sample of 145 Grocery Checkers as the most representative available sample of workers in this occupation as it exists today, an attempt was made to find a set of norms which would show good selective efficiency for the Safeway Stores sample and for one or more of the other five samples for which data were available. In accordance with this objective, it was possible to establish norms for Grocery Checker 1-03.05 on the basis of the results obtained for the Safeway Stores and Orange Coast College samples. Results obtained for the other samples cited above were too divergent from those of the Safeway Stores and Orange Coast College samples to be used in combination with them in the establishment of test norms for Grocery Checker.

IX. Determination of Occupational Aptitude Pattern

When the specific test norms for an occupation include three aptitudes, only those occupational aptitude patterns which include the same three aptitudes with cutting scores that are within 10 points of the cutting scores established for the specific norms are considered for that occupation. The only one of the existing 23 occupational aptitude patterns which meets these criteria for this study is OAP-6 which consists of G-95, N-90, and Q-95 for B-1002 and G-100, N-95, and Q-95 for B-1001. The selective efficiency of OAP-6 for the Combined Sample was determined by means of the tetrachoric correlation technique. A tetrachoric correlation of .51 with a standard error of .12 was obtained, which indicates a significant relationship between OAP-6 and the criterion for this experimental sample. The proportion of the sample screened out by OAP-6 was .22, which is within the required range of .10 to .60. Therefore, it is recommended that OAP-6 be used in counseling for the occupation of Grocery Checker 299.468.